Artificial Intelligence and NLP Startups in Agriculture: How AI startups help solving problems in farming

Introduction

Artificial Intelligence in agriculture appear to fall into three major categories: Agricultural Robots, Crop and Soil Monitoring and Predictive Analytics. While there are large number of startups working on a wide variety of solutions, this document emphasizes on few promising startups across the globe. A brief overview of a paper presented on smart answering Chatbot application using Natural Language Processing coupled with various IoT devices is also provided. These technics aid farmers connect with their farms 24X7.

These startups help farmers in different phases of agriculture cycle. Namely preparation of soil and sowing of seeds, fertilizers, irrigation, weeding and harvesting.

Artificial Intelligence Startups in Agriculture:

Blue River Technologies:

Founded in 2011 in California, this company aims to make farming more sustainable through robotics and computer vision. Their first smart machine "the lettuce bot" focused on lettuce thinning, a traditionally time-intensive and expensive task of eliminating unwanted lettuce seedlings. The lettuce bot automated this arduous process by taking images, identifying which plants to remove, spraying them, and verifying the accuracy and performance of the system, all in real time.

Over-relying on a handful of broadcast-spray chemicals fuels the evolution of herbicide tolerance. Fighting these weeds hurts farmers' crops and their profitability. Blue River's smart machines give farmers a new way to control and prevent herbicide-resistant weeds, while also eliminating 90% of the herbicide volumes that growers spray today.

See & Spray is the next generation of Blue River's technology. See & Spray machines leverage deep learning to enable machines to identify a greater variety of plants—both crops & weeds—with better accuracy, and then make crop management decisions on the spot. Custom nozzle designs enable <1-inch spray resolution, and powerful software powers faster and more agile crop protection. See & Spray is currently operating in weeding for cotton and soybeans.

FarmWise:

Founded in 2016, FarmWise leverages state-of-the-art technologies to perform plant-level interventions.

This company provides a robotic, mechanical weeder for no-herbicide farms. It is a chemical-free option for weed control is in the sprawling fields of California's elite organic vegetable growers.

Fasal:

Founded in 2018 in India, Fasal, a product of Wolkus, helps farmers with small agriculture land reduce the cost of cultivation and increase quality and yield, through their AI powered platform for horticulture, delivering farm specific, crop specific, crop-stage specific, actionable advisory. While the small farmlands pose a challenge for automation through robotics, it is beneficial for automated monitoring as a lesser number of devices, with reduced bandwidths, is enough to capture all the farm data.

This company provides affordable sensors and AI to provide the farmer with real-time data and insights, remote access to all the information via multiple mediums, predictions about resource requirements including irrigation, sprays, fertilization, and other preventive measures. To add, the company's sensor station is easy to implement for the small farmer.

AgroScout:

Founded in 2017 in Israel, this company focused on developing advanced technology for early-stage detection of crop diseases to improve yields, reduce pesticide use, and increase profits. Their app shows you where the infections are in the field. And just like road navigation apps, the app will help you "navigate" to each infected location.

There are options to report your findings manually and to record chemical applications. Agronomists or crop advisers, the farmers are working with, (or from the AgroScout network of agronomists) can also send their recommendations via the app.

- In-app navigation to drive the Drone to infected locations
- Apply chemicals locally
- Enables damage-reconnaissance flight over infected areas

Harvest CROO Robotics:

This company focuses on "Conservation of Motion" robotics, meaning they optimize the individual tasks that a harvester accomplishes. They don't use a single robotic arm to accomplish the picking of strawberries; instead they use multiple robotic components to separate the picking functions of leaf gathering, visual inspection, picking and then packing. This allows us to build simpler robots, which run faster and operate at the scale needed to support current farm operations.

Root.AI:

Indoor farming represents a massive leap in progress toward true agricultural independence, sustainability, and efficiency. At a modern greenhouse, reclamation of water, digitally controlled light, nutrients, and atmosphere mean that over 20x the amount of crop per acre can be produced with 90% less water than traditional methods.

Root.AI's vision systems can "see" fruits and understand whether they're ripe and ready to pick even in highly cluttered and complicated growing environments. Their patent-pending grippers can reach deep into tangled vines and pluck a single ripe fruit without leaving a mark. Their sensors see the world in full 3D and can use this information to plan just the right path to the target.

Prospera:

Founded in 2014, this Israeli company transformed the way farming is done. This company analyzes field images with Convolutional Neural Networks to identify pests and diseases, monitor agro-technical activities and collect yield data. They use Deep Learning techniques to solve multi-dimensional planning and assignment optimization problems across massive data sets to extract insights from multiple data sources that are harmonized in an advanced Big Data framework.

Having their production information ready and available, farmers significantly saved in fertilizers, chemical use, man-hours and avoided a significant yield lost.

AGEYE Technologies:

Founded in 2018, AgEye has offices in Raleigh, North Carolina (USA) and Bangalore, Karnataka (India). AgEye Technologies is pioneering the use of computer machine vision, deep learning neural networks and IoT-connected devices to create the next generation of autonomous indoor farms. Comprised of a talented team of agriculturists and technologists who have a shared passion for digital horticulture, artificial intelligence and creating a sustainable food supply for the growing global population. The company's mission is to develop technology that helps indoor farms become sustainable and scalable through significant reductions in operational costs.

AgronomoBot: a smart answering Chatbot applied to agricultural sensor networks

This is based on a paper presented at 14th International Conference on Precision Agriculture from June 24th – 27th 2018 at Montreal, Quebec, Canada.

AgronomoBot was developed focused on the search and display of data acquired from a Wireless Sensor Network deployed on a vineyard. It is based on Telegram Bot API and can access information collected by eKo field sensors, bringing it back to a user through interaction over the Telegram application. The IBM Watson cognition services platform was also used for improving the user experience by enabling the use of natural language during the conversation experience, providing intention detection.

This chatbot uses NLP and AI to interact with the user and search for the desired information in a WSN (Wireless Sensor Network), adapting to different forms of dialogue to achieve the same intention. The functionalities developed for the chatbot system are demonstrated in the screenshot shown below. AgronomoBot can easily be adapted to any language, supported by the NLP algorithm used for its development.

Screenshot below shows a demonstration of interaction between a farmer and AgronomoBot.
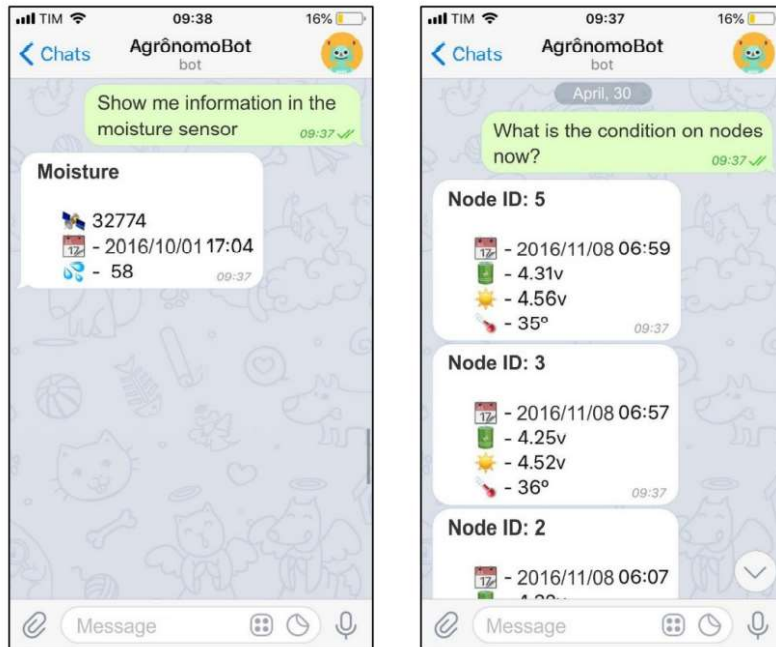
Conclusion

AI technologies help farmers to analyze soil or health of crop and save time and allow them to grow right crop in each season that can give best yield. AI technologies can reduce the problems with labor unavailability and help predictions on weather / climate / rainfall. AI based predictions enable suggesting appropriate pesticides/crops/place at right time before large scale incidence of disease. As discussed above, using apps like AgronomoBot can help farmers monitor and get real time insights and respond from home. Since the automatic response system space is largely untouched, there is a huge opportunity for the agriculture industry to leverage emerging technology of chatbots and assist farmers with the answers to all their queries, giving relevant advice and recommendations and act as needed. This in turn can further propel the growth of the AI market in agriculture.

References:

https://ai-startups.org/top/agriculture/

https://www.startus-insights.com/innovators-guide/5-top-artificial-intelligence-startups-impacting-agriculture/

Mostaço, Gustavo & Campos, Leonardo & Souza, Ícaro & Cugnasca, Carlos. (2018). AgronomoBot: a smart answering Chatbot applied to agricultural sensor networks.

Panpatte, Deepak. (2018). Artificial Intelligence in Agriculture: An Emerging Era of Research.